# 1969

## OPERATING SUMMARY

# PORT ARTHUR

## water pollution control plant



ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 195
Ontario

The operating efficiency and financial status of the water pollution control facilities operated for you in 1969 are presented in the following pages.

The regional operations engineer's comments and the statistical data will assist you in gauging the plant's level of performance. A new flow chart and up-to-date design data are also provided.

Various divisions and sections within the Commission have co-operated in providing what we trust is an accurate and concise annual operating summary.

D.S. Caverly,
General Manager.

D.A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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# PORT ARTHUR

## water pollution control plant

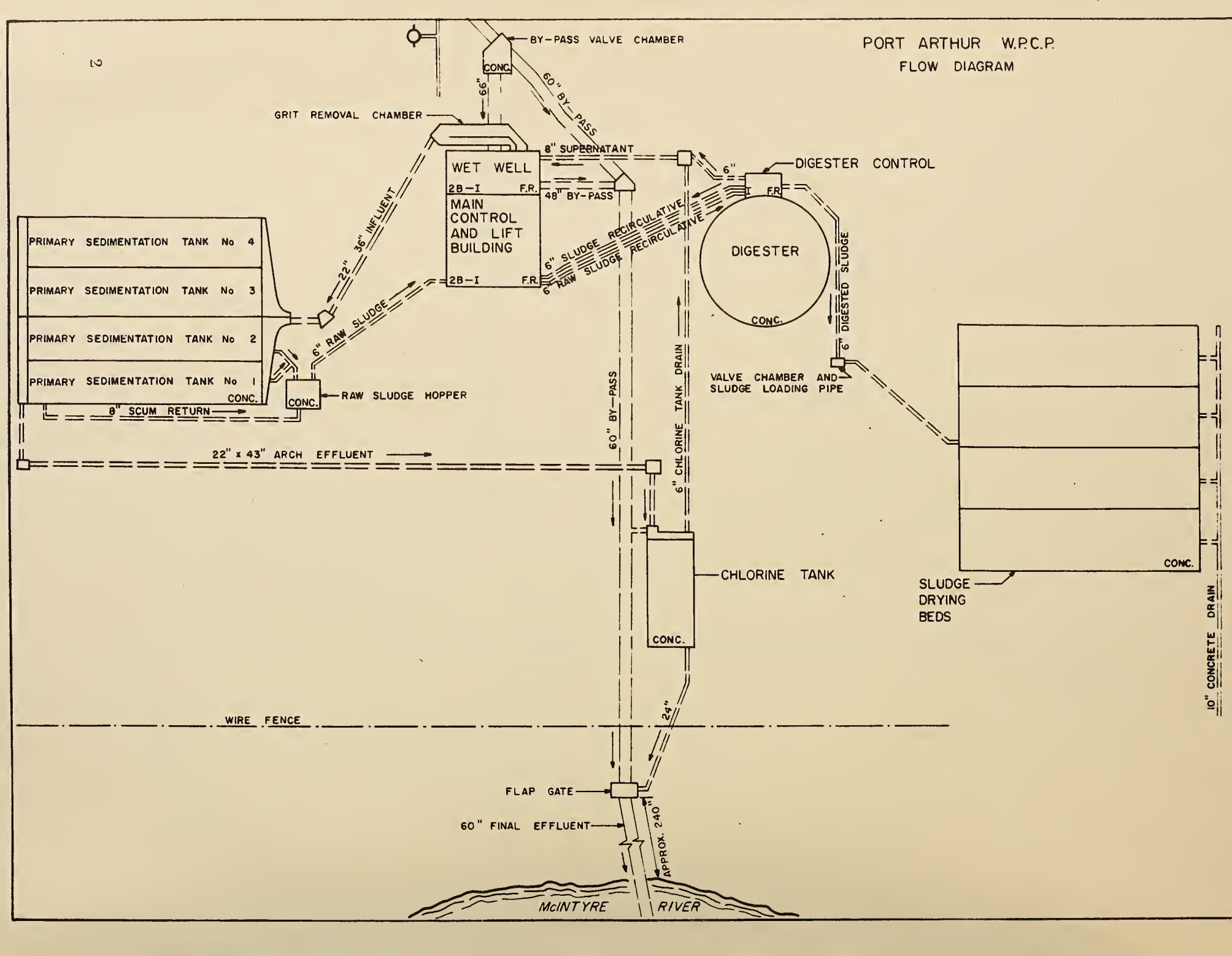
operated for

THE CITY OF PORT ARTHUR

by the

ONTARIO WATER RESOURCES COMMISSION

## 1969 ANNUAL OPERATING SUMMARY


PORT ARTHUR W.P.C.P.
FLOW DIAGRAM
BY-PASS VALVE CHAMBER
CONC.
66"
60" BY-PASS
GRIT REMOVAL CHAMBER
8" SUPERNATANT
WET WELL
2B-I F.R.
MAIN CONTROL AND LIFT BUILDING
2B-I F.R.
48" BY-PASS
DIGESTER CONTROL
6"
I F.R.
6" SLUDGE RECIRCULATIVE
6" RAW SLUDGE RECIRCULATIVE
DIGESTER
CONC.
6" DIGESTED SLUDGE
22" 36" INFLUENT
PRIMARY SEDIMENTATION TANK No 4
PRIMARY SEDIMENTATION TANK No 3
PRIMARY SEDIMENTATION TANK No 2
PRIMARY SEDIMENTATION TANK No 1
CONC.
6" RAW SLUDGE
CONC.
RAW SLUDGE HOPPER
8" SCUM RETURN
VALVE CHAMBER AND SLUDGE LOADING PIPE
22" x 43" ARCH EFFLUENT
60" BY-PASS
6" CHLORINE TANK DRAIN
CHLORINE TANK
CONC.
SLUDGE DRYING BEDS
CONC.
10" CONCRETE DRAIN
WIRE FENCE
24"
FLAP GATE
60" FINAL EFFLUENT
APPROX. 240"
McINTYRE RIVER

# DESIGN DATA

| | | | |
|---|---|---|---|
| PROJECT NO. | 2-0013-58 | TREATMENT Primary | |
| DESIGN FLOW | 4.0 mgd | DESIGN POPULATION | 40,000 |

## PRIMARY TREATMENT

### Grit Removal

Type: Channels; mechanically cleaned (Rex San.)
Size: Two 35' x 3' x 5' deep (6,540 gal)
Retention: 4.7 min (two channels)
Flow Velocity: 0.248 fps

### Comminution

Type: Barminutor
Size: One Model B (35")
One Model A1 (48")

### Sewage Lift Pumps

a) Type: Chicago Pumps (ele)
Size: Two 4150 gpm @ 50' tdh

b) Type: Fairbanks-Morse (diesel)
Size: One 29,000 gpm @ 33' tdh

### Primary Sedimentation

Type: Jeffrey
Size: Four 100' x 18' x 8' deep (356,000 gal)
Retention: 2.14 hr
Loading: Surface, 560 gal/ft$^2$/day
Weir, 6,000 gal/ft/day

## CHLORINATION

Type: W & T
Size: One 500 lb/day

### Chlorine Contact Chamber

Size" 45' x 20' x 10'
Retention: 20 min

## OUTFALL

- 240' of 60" dia corrugated pipe to McIntyre River

## SLUDGE HANDLING

### Digestion System - Single-stage

Type: Mixed by recirculation; floating cover
Size: One 50' dia x 20' swd (50,000 cu ft or 0.312 mil gal)
Loading: 2.0 lb/cu ft/mo

### Drying Beds

Size: Four 100' x 25' (10,000 sq ft)

# '69 REVIEW

## GENERAL

The total flow for the year, 1716 million gallons, was approximately 237 million gallons less than in 1968. This small decrease had little effect on the efficiency of the plant's process, with 43% and 55% BOD and suspended solids removal respectively compared to 42% and 57% in 1968. According to the probability of occurrence graph, the plant operated at or above the design capacity 70% of the time.

The plant experienced only minor difficulties throughout the year. It was staffed by a chief operator and three plant operators. Casual labour was employed when required. This allowed 16-hour supervision, seven days a week.

## EXPENDITURES

During 1969, the total expenditure was $63,095.36. The treatment cost for a million gallons was $36.76, or five cents a pound of BOD removed. The costs were similar to those of 1968 with only a $4.13 increase for each million gallons treated.

Payroll and power were the highest percentages of the total operating costs. None of the ten sub-divisions (payroll, fuel, etc.) exceeded 1968 values by more than four percent, and few varied more than one percent.

## PLANT FLOW and CHLORINATION

A total of 1716 mil. gal. of sewage was treated during the year. The average daily flow was 4.7 mil. gal., while the maximum and minimum daily flows were 8.0 and 3.6 mil. gal.

Chlorination of the effluent was practised between May 15 and November 9. A total of 31,950 pounds was used at an average dosage of 3.9 milligrams per litre.

## PLANT EFFICIENCY

The influent BOD and suspended solids were 183 mg/l and 163 mg/l respectively, with effluents of 104 mg/l and 73 mg/l. These results gave an average removal of 47% BOD and 55% suspended solids.

## SLUDGE

Throughout the year, 4,620,000 gallons of raw sludge were treated at the plant. The percent total solids increased from 3.0 in the raw sludge to 7.0 in the digested sludge.

A total of 6,032 cu. yd. of liquid sludge was hauled during the year.

## CONCLUSIONS

Amalgamation of the Cities of Port Arthur and Fort William into the new City of Thunder Bay influences plans for the future of the Port Arthur plant.

Treatment for the area will eventually be provided at one convenient location.

# PROJECT COSTS

| | | | |
|---|---|---|---|
| NET CAPITAL COST: | 2-0013-58 (Final) | | $2,157,635.72 |
| | 2-0101-62 (Final) | | 699,693.96 |
| | 2-0156-63 (Estimated) | | 610,181.87 |
| | | | $3,467,511.55 |
| DEDUCT - Portion Financed by CMHC- | | | |
| | 2-0101-62 | $457,785.36 | |
| | 2-0156-63 | 393,042.83 | |
| Payments from Municipality | | | |
| | 2-0013-58 | 1,457.58 | 852,285.77 |
| Long Term Debt to OWRC | | | $2,615,225.78 |

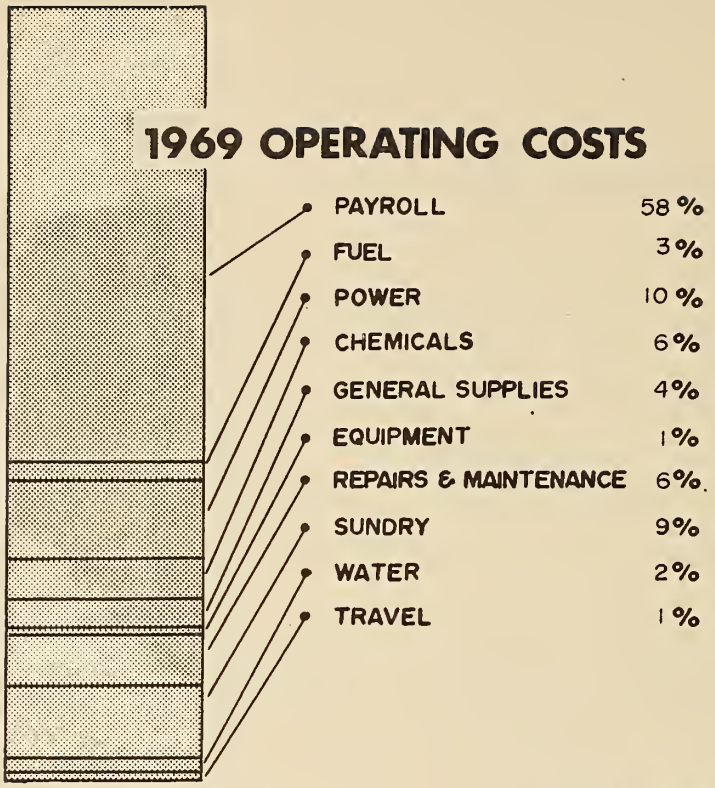
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969:

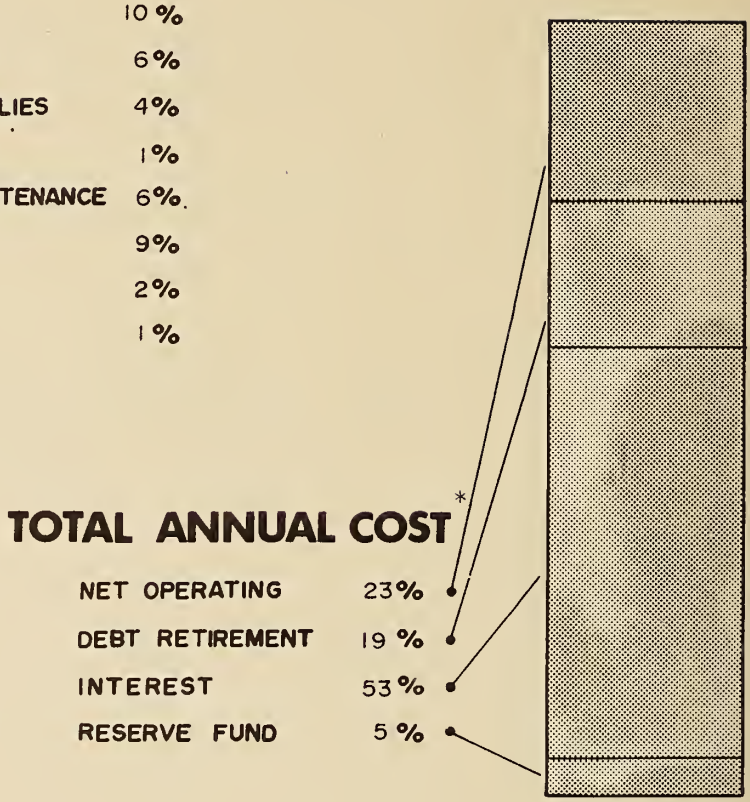
| | | |
|---|---|---|
| 2-0013-58 | $577,362.29 | |
| 2-0101-62 | 36,158.99 | |
| 2-0156-63 | 24,950.51 | |
| | | $ 638,471.79 |

| | 2-0013-58 | 2-0101-62 | 2-0156-63 | Total |
|---|---|---|---|---|
| Net Operating | $ 63,095.36 | $ - | $ - | $ 63,095.36 |
| Debt Retirement | 43,516.00 | 4,882.00 | 4,382.00 | 52,780.00 |
| Reserve | 7,424.84 | 3,563.46 | 2,217.79 | 13,206.09 |
| Interest Charged | 120,715.51 | 13,543.21 | 12,156.49 | 146,415.21 |
| TOTAL | $234,751.71 | $21,988.67 | $18,756.28 | $275,496.66 |

## RESERVE ACCOUNT

| | | | | |
|---|---|---|---|---|
| Balance @ January 1, 1969 | $139,818.66 | $28,084.54 | $11,737.21 | $179,640.41 |
| Deposited by Municipality | 7,424.84 | 3,563.46 | 2,217.79 | 13,206.09 |
| Interest Earned | 8,002.52 | 1,676.14 | 716.96 | 10,395.62 |
| | $155,246.02 | $33,324.14 | $14,671.96 | $203,242.12 |
| Less Expenditures | 2,500.00 | - | - | 2,500.00 |
| Balance @ December 31, 1969 | $152,746.02 | $33,324.14 | $14,671.96 | $200,742.12 |




## Yearly Operating Costs

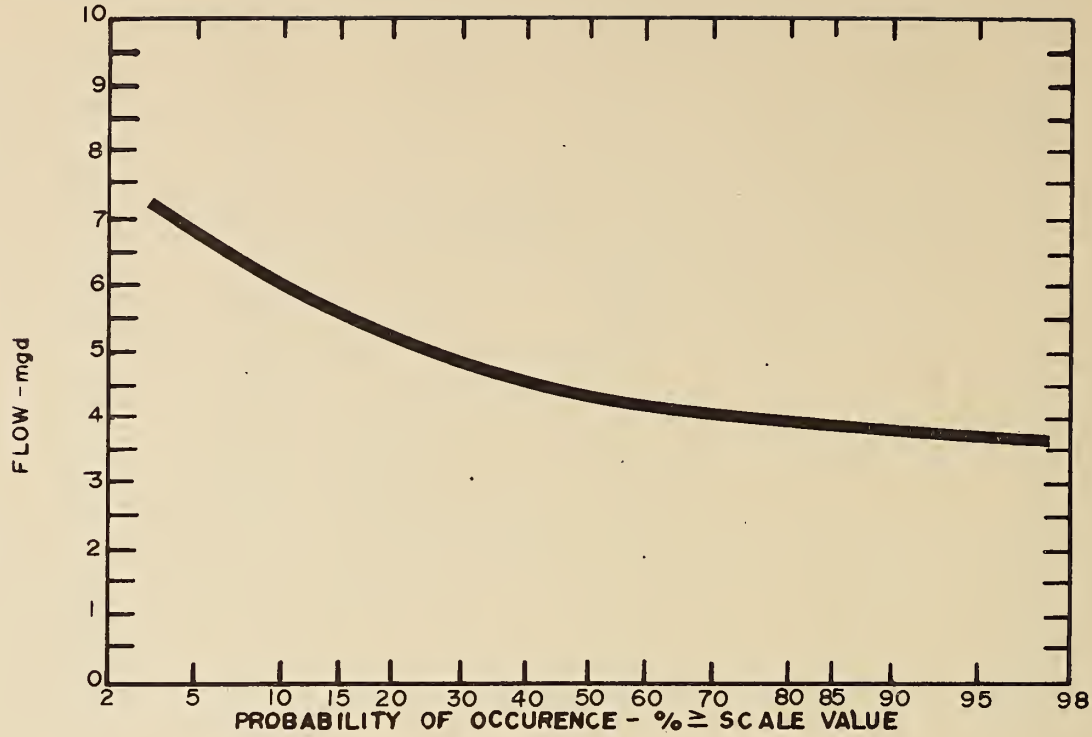
| YEAR | MILLION GALLONS TREATED | TOTAL OPERATING COSTS | COST PER MILLION GAL | COST PER LB OF BOD REMOVED |
|---|---|---|---|---|
| 1965 | 1883.74 | $44,533.19 | $23.64 | 3 cents |
| 1966 | 1825.52 | 49,656.84 | 27.20 | 3 cents |
| 1967 | 1813.46 | 56,202.44 | 30.99 | 5 cents |
| 1968 | 1953.80 | 63,745.04 | 32.63 | 5 cents |
| 1969 | 1716.30 | 63,095.36 | 36.76 | 5 cents |

* All projects

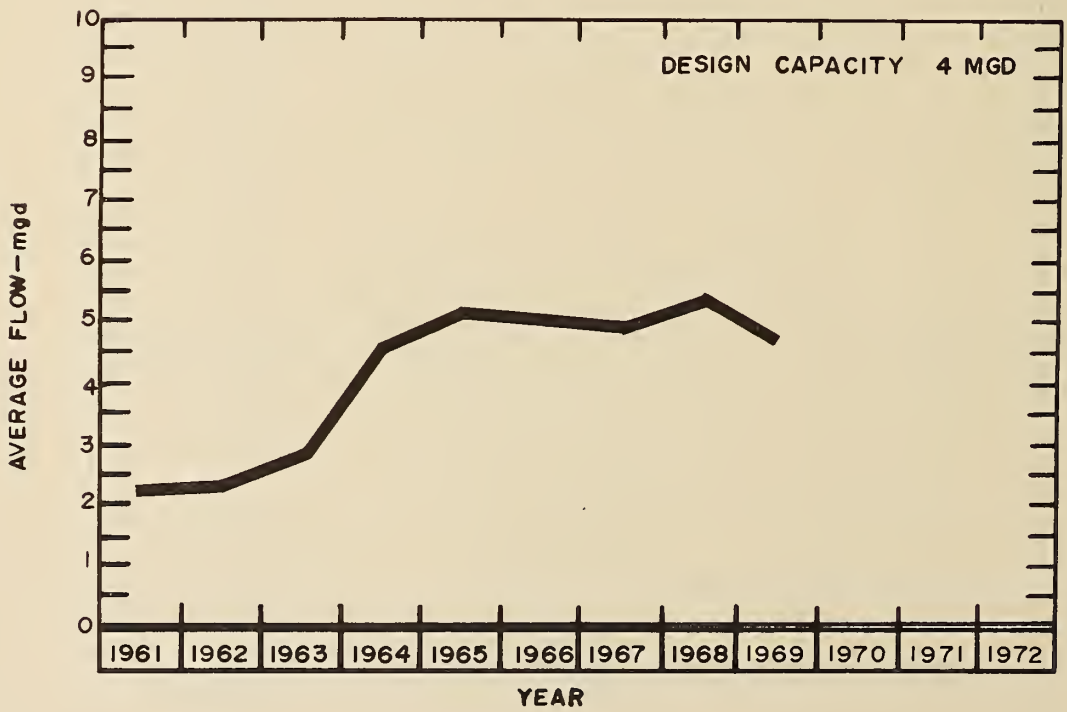
# Monthly Operating Costs

| MONTH | TOTAL EXPENDITURE | PAYROLL | CASUAL PAYROLL | FUEL | POWER | CHEMICALS | GENERAL SUPPLIES | EQUIPMENT | REPAIRS and MAINTENANCE | SUNDRY* | WATER | TRAVEL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 5464.90 | 3628.57 | 493.69 | 182.19 | 562.58 | - | 43.60 | 114.64 | - | 44.00 | 380.43 | 15.20 |
| FEB | 3631.79 | 2238.50 | 362.20 | 187.10 | 500.35 | - | 126.74 | - | 186.10 | 16.03 | - | 14.77 |
| MAR | 4282.54 | 2238.50 | 296.15 | 167.93 | 500.31 | - | 219.88 | 19.58 | 116.97 | 707.83 | - | 15.39 |
| APR | 3850.93 | 2311.38 | 295.14 | 133.12 | 568.89 | - | 138.59 | - | 171.55 | 20.36 | 197.15 | 14.75 |
| MAY | 6156.19 | 2571.05 | 651.37 | 103.72 | 687.36 | 1425.90 | 256.15 | 78.04 | 177.74 | 101.72 | - | 102.74 |
| JUNE | 4687.09 | 2252.74 | 826.50 | 167.60 | 511.75 | - | 191.56 | 84.99 | 183.85 | 447.16 | - | 20.94 |
| JULY | 8619.97 | 2249.89 | 888.37 | 230.05 | 511.92 | 40.95 | 400.99 | - | 1200.14 | 2593.98 | 397.60 | 106.08 |
| AUG | 6766.78 | 3347.70 | 1617.69 | - | - | 1425.90 | 191.87 | - | 134.24 | 34.05 | - | 15.33 |
| SEPT | 4633.12 | 2252.74 | 780.74 | 211.79 | 984.06 | - | 120.72 | - | 169.12 | 18.19 | - | 95.76 |
| OCT | 5678.26 | 2235.08 | 413.49 | - | 468.23 | 568.47 | 174.65 | 25.25 | 146.40 | 976.28 | 591.89 | 78.52 |
| NOV | 3728.07 | 2229.38 | 221.66 | 240.67 | 533.00 | 31.83 | 115.10 | 37.77 | 191.85 | 111.08 | - | 15.73 |
| DEC | 5595.72 | 2280.28 | 425.92 | 151.16 | 510.10 | - | 397.43 | 22.00 | 914.58 | 859.58 | - | 34.67 |
| TOTAL | 63095.36 | 29835.81 | 7272.92 | 1775.53 | 6338.55 | 3493.05 | 2377.28 | 382.27 | 3592.54 | 5930.46 | 1567.07 | 529.88 |

* SUNDRY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE $4305.80


FLOW - mgd
0
1
2
3
4
5
6
7
8
9
10
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PROBABILITY OF OCCURENCE - % ≥ SCALE VALUE

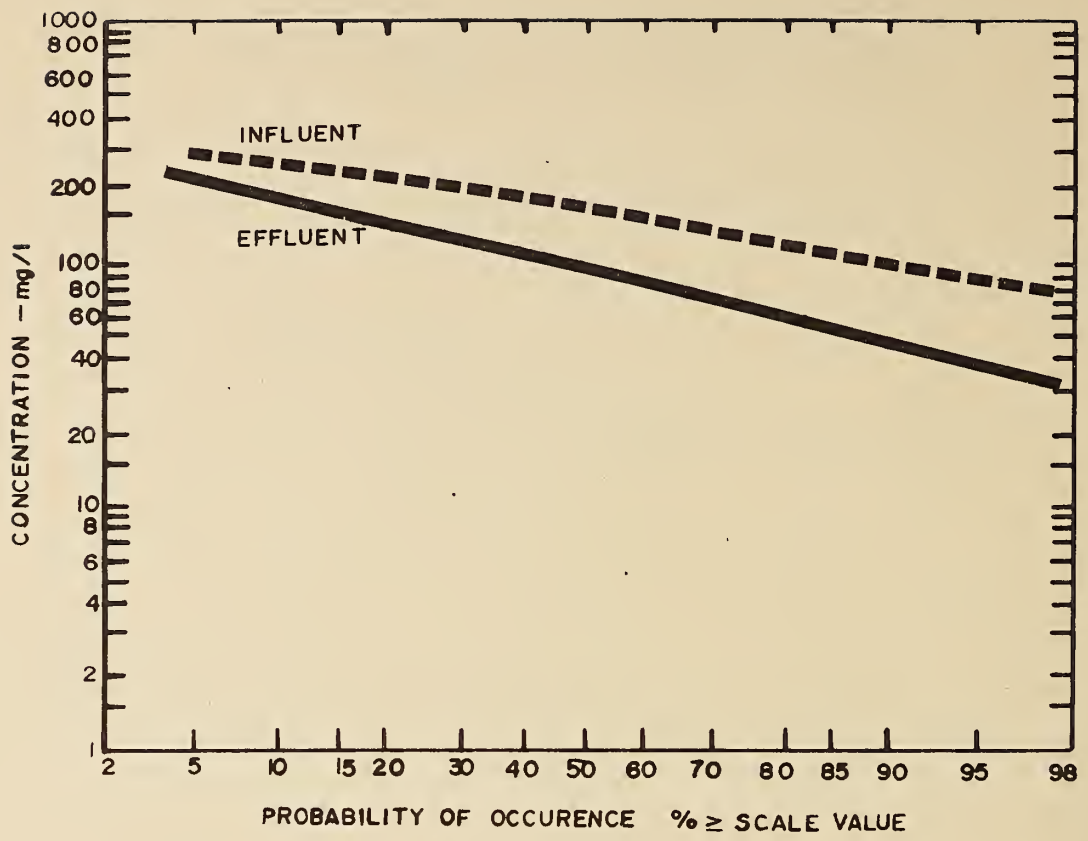
# FLOWS


AVERAGE FLOW - mgd
0
1
2
3
4
5
6
7
8
9
10
DESIGN CAPACITY 4 MGD
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
YEAR

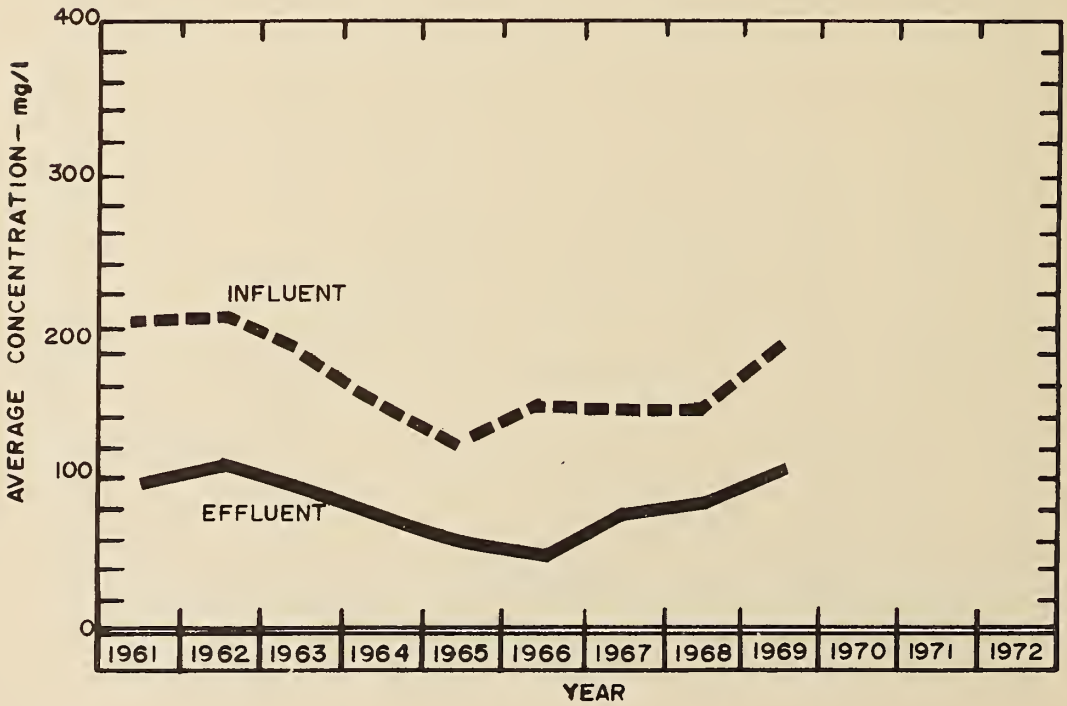
# PLANT FLOWS and CHLORINATION

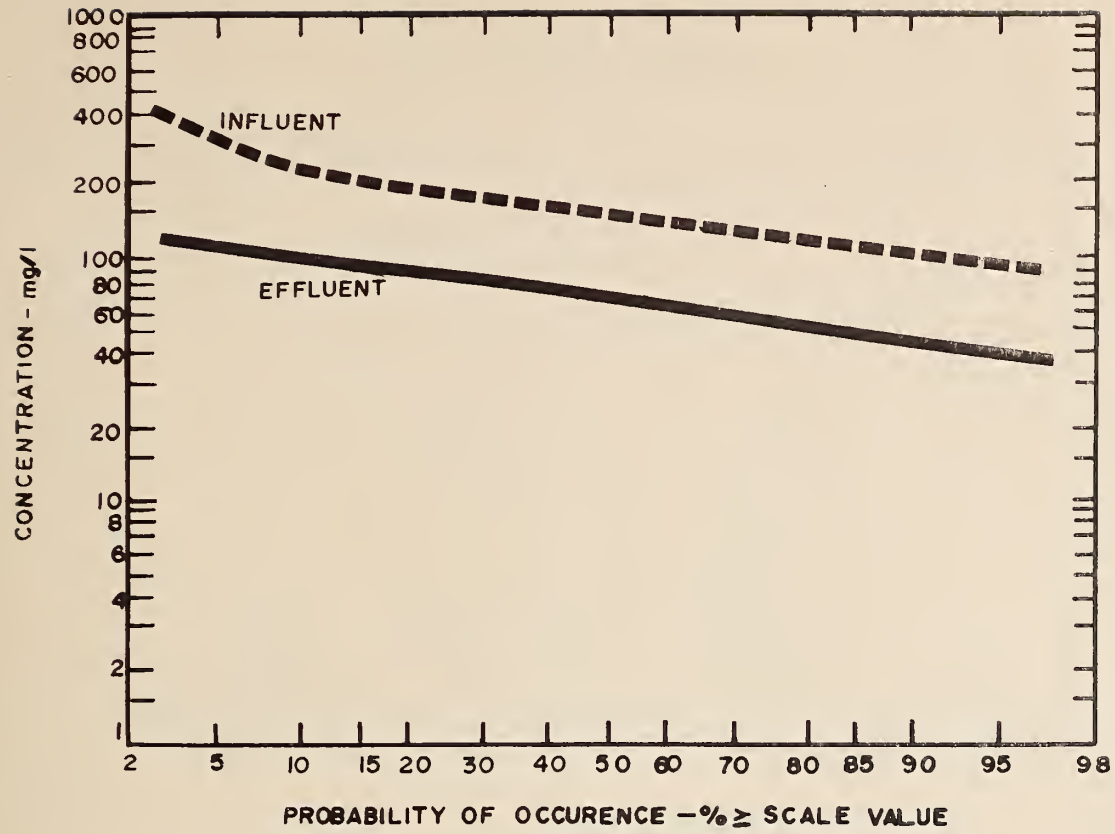
| MONTH | TOTAL FLOW mil gal | AVERAGE DAILY FLOW mil gal | MAXIMUM DAILY FLOW mil gal | MINIMUM DAILY FLOW mil gal | CHLORINE USED $10^3$ pounds | DOSAGE mg/l |
|---|---|---|---|---|---|---|
| JAN | 122.7 | 4.0 | 4.2 | 3.6 | 0 | 0 |
| FEB | 108.9 | 3.9 | 4.3 | 3.6 | 0 | 0 |
| MAR | 150.8 | 4.9 | 7.1 | 3.9 | 0 | 0 |
| APR | 212.1 | 7.1 | 8.0 | 5.5 | 0 | 0 |
| MAY | 171.9 | 5.5 | 6.8 | 4.7 | 3.05* | 1.8 |
| JUNE | 150.8 | 5.0 | 5.9 | 4.3 | 6.28 | 4.2 |
| JULY | 143.1 | 4.6 | 4.9 | 4.1 | 5.20 | 3.6 |
| AUG | 142.3 | 4.6 | 5.9 | 3.9 | 5.42 | 3.8 |
| SEPT | 130.0 | 4.3 | 5.5 | 3.8 | 5.45 | 4.2 |
| OCT | 132.8 | 4.3 | 5.2 | 4.0 | 5.60 | 4.2 |
| NOV | 126.5 | 4.2 | 4.6 | 4.0 | .95* | 2.5 |
| DEC | 124.4 | 4.0 | 4.2 | 3.7 | 0 | 0 |
| TOTAL | 1716.3 | - | - | - | 31.95 | - |
| AVERAGE | - | 4.7 | - | - | 5.32 | 3.9 |

* Chlorination between May 15 and November 9.

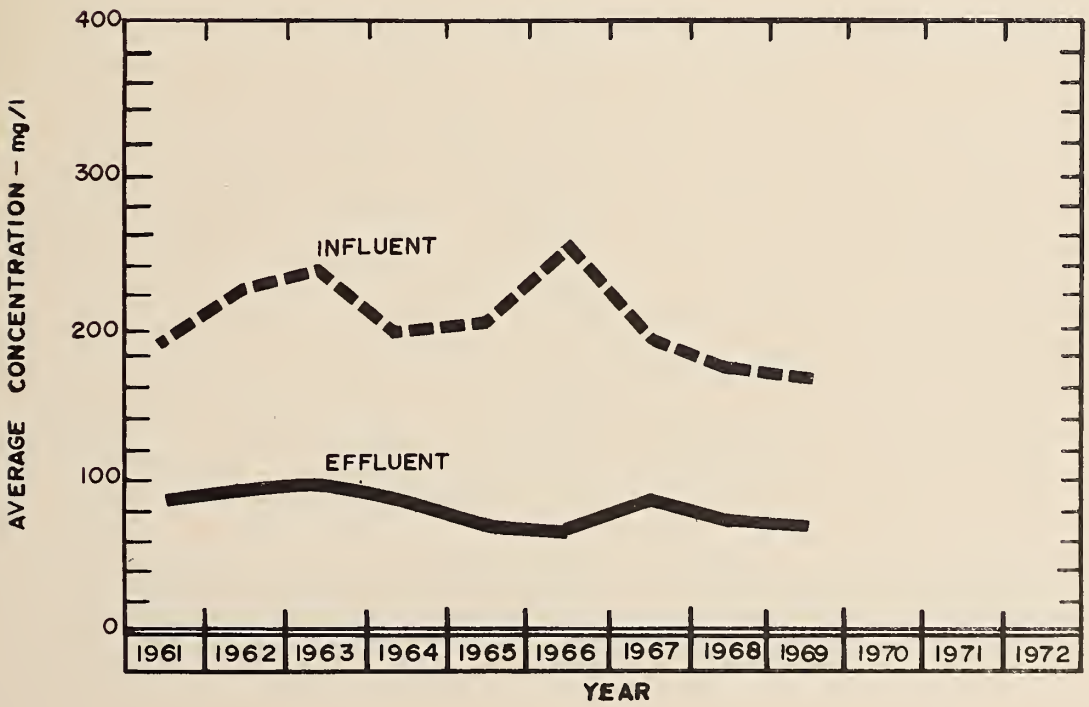



# BIOCHEMICAL OXYGEN DEMAND



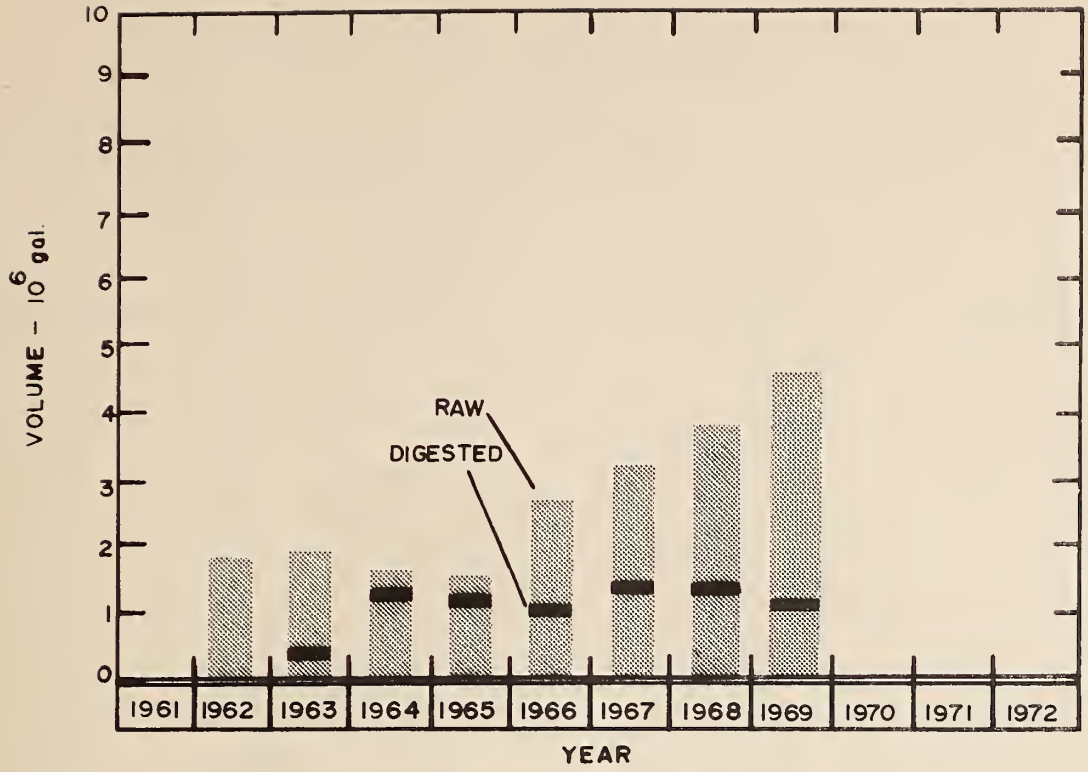



# SUSPENDED SOLIDS

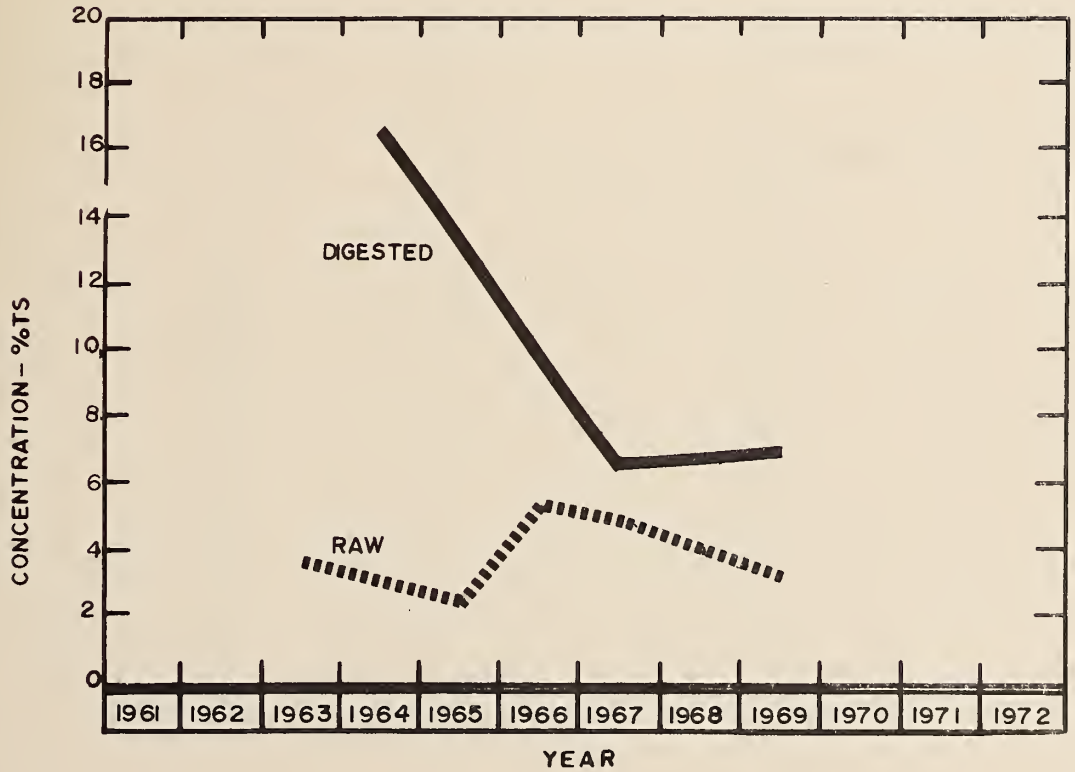


# PLANT EFFICIENCY

| MONTH | BIOCHEMICAL OXYGEN DEMAND | | | | SUSPENDED SOLIDS | | | | GRIT REMOVAL |
|---|---|---|---|---|---|---|---|---|---|
| | INF. | EFF. | REDUCTION | | INF. CONCN | EFF. CONCN | REDUCTION | | |
| | mg/l | mg/l | % | $10^5$ pounds | mg/l | mg/l | % | $10^5$ pounds | cu ft |
| JAN | 209 | 143 | 32 | .8 | 180 | 93 | 48 | 1.1 | 32 |
| FEB | 198 | 154 | 22 | .5 | 170 | 94 | 45 | .8 | 98 |
| MAR | 377 | 83 | 78 | 4.4 | 151 | 82 | 46 | 1.0 | 82 |
| APR | 102 | 78 | 24 | .5 | 117 | 71 | 39 | 1.0 | 103 |
| MAY | 157 | 107 | 32 | .9 | 121 | 65 | 46 | 1.0 | 87 |
| JUNE | 148 | 83 | 51 | 1.0 | 135 | 61 | 55 | 1.1 | 86 |
| JULY | 134 | 77 | 42 | .8 | 144 | 60 | 58 | 1.2 | 92 |
| AUG | 144 | 80 | 44 | .9 | 185 | 50 | 73 | 1.9 | 164 |
| SEPT | 178 | 105 | 41 | 1.0 | 225 | 77 | 66 | 1.9 | 90 |
| OCT | 170 | 86 | 49 | 1.1 | 163 | 57 | 65 | 1.4 | 129 |
| NOV | 177 | 129 | 27 | .6 | 197 | 70 | 64 | 1.6 | 89 |
| DEC | 200 | 126 | 37 | .9 | 172 | 93 | 46 | 1.0 | 68 |
| TOTAL | - | - | - | - | - | - | - | - | 1120 |
| AVERAGE | 183 | 104 | 43 | 1.1 | 163 | 73 | 55 | 1.3 | 93 |


VOLUME - $10^6$ gal.
10
9
8
7
6
5
4
3
2
1
0
RAW
DIGESTED
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
YEAR

# DIGESTION


CONCENTRATION - %TS
20
18
16
14
12
10
8
6
4
2
0
DIGESTED
RAW
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
YEAR

# SLUDGE DIGESTION and DISPOSAL

| MONTH | RAW SLUDGE | | | DIGESTED SLUDGE | | | SUPERNATANT | | SLUDGE DISPOSAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| | VOLUME $10^5$ gal | TOTAL SOLIDS % | VOL SOLIDS % | VOLUME $10^5$ gal | TOTAL SOLIDS % | VOL SOLIDS % | VOLUME $10^5$ gal | TOTAL SOLIDS % | DEWATERED cu yd | LIQUID cu yd |
| JAN | 3.9 | 2.1 | 82 | 0 | 4.9 | 76 | 3.9 | - | 0 | 0 |
| FEB | 3.4 | - | - | 0 | - | - | 3.3 | - | 0 | 0 |
| MAR | 4.2 | 2.4 | 91 | 1.3 | 4.7 | 85 | 2.7 | - | 0 | 759 |
| APR | 3.6 | - | - | .6 | - | - | 3.0 | - | 0 | 341 |
| MAY | 3.9 | - | - | 5.1 | - | - | 1.2 | - | 0 | 3009 |
| JUNE | 3.9 | - | - | 1.3 | - | - | 1.4 | - | 0 | 750 |
| JULY | 3.4 | 4.2 | 79 | 0 | 9.9 | 65 | 3.4 | - | 0 | 0 |
| AUG | 3.0 | 3.4 | 70 | 0 | 8.8 | 58 | 3.0 | - | 0 | 0 |
| SEPT | 4.2 | - | - | 2.0 | - | - | 2.4 | - | 0 | 1173 |
| OCT | 4.2 | - | - | 0 | - | - | 4.2 | - | 0 | 0 |
| NOV | 4.3 | - | - | 0 | - | - | 4.2 | - | 0 | 0 |
| DEC | 4.2 | - | - | 0 | - | - | 4.1 | - | 0 | 0 |
| TOTAL | 46.2 | - | - | 10.3 | - | - | 36.8 | - | 0 | 6032 |
| AVERAGE | 3.8 | 3.0 | 80 | - | 7.0 | 71 | 3.1 | - | 0 | - |

*Water management in Ontario*